# Lapita-Associated Skeletons from Watom Island, Papua New Guinea, and the Origins of the Polynesians

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THE LAPITA CULTURAL COMPLEX, now dated between 3600 and 2500 years B.P., represents the initial, and relatively rapid, colonization of Polynesia and the neighboring regions of the Pacific by Austronesian-speaking peoples (Bellwood 1979, 1985; Green 1979; Kirch 1988). The distribution of Lapita sites extends from the Bismarck Archipelago region in Papua New Guinea through Melanesia to the island nations of Fiji, Tonga, and Samoa in the east. Although some of the earliest sites are located in the western portion of this distribution, the immediate origins of the Lapita culture and people remain elusive. Indigenous development from cultures already present in Melanesia (Green 1979; Spriggs 1984; Allen 1984) and an Island Southeast Asian origin (Bellwood 1979, 1985) represent two contrasting archaeological interpretations.

While the evidence from archaeology for documenting the Lapita Cultural Complex and its origins is substantial, there are relatively few skeletal remains for investigating the biological origins of these people. Recent excavations in Rakival Village on Watom Island, East New Britain Province of Papua New Guinea, have increased the total number of Lapita skeletons from this site to eight, making this one of the largest Lapita-associated skeletal samples now available. This paper briefly summarizes the results of univariate and multivariate comparisons of the Watom and other Lapita remains with more modern skeletal populations from Asia and the Pacific. Biological relationships and the origins of the Polynesians are assessed in light of this new information.

## MATERIAL

Six adult male and two adult female skeletons are represented in the Watom Island sample. Specht (1968) excavated three of eight skeletons in 1966, and Green and Anson (1987) excavated five more in 1985. The burials are dated c. 500–100 B.C.,

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probably towards the latter end of that range. Only two skeletons have associated cranial remains, and very few of the long limb bones are intact. The most complete bone is the lower jaw; four mandibles are represented in this sample.

Other Lapita-associated remains used in this paper include a partially complete adult male skeleton from Natunuku, Fiji, excavated by Shaw (1967, 1975) and described by Pietrusewsky (1985). The remains of two individuals from Lakeba in the Lau Group, Fiji Islands (Best 1977), and a single skeleton (Burial AK) from Tonga excavated by Poulsen (1987) and described by Spennemann (1987) were also examined. The latter material is associated with the Lapita Culture and dates from approximately the middle of the first millennium B.C. Finally, a mandible fragment excavated by Wal Ambrose from Manus, Admiralty Islands, although not associated with Lapita Culture, is roughly contemporaneous with the latest phase of the Lapita Culture. The date for the site on Manus has been recently revised to 2100 B.P. (Ambrose 1988*a*, 1988*b*). Comparative osteological data for a number of near-contemporary populations of the Pacific and Asia used in this paper were recorded by the author over a period of several years.

## METHODS

All data were analyzed at the University of Hawaii-Manoa on an IBM 3081 computer using various statistical packages (e.g., SAS and BMDP) and other specially written computer programs. Univariate (descriptive statistics) and multivariate statistical procedures were applied to various aspects of dental and skeletal anatomy. Mahalanobis's Generalized Distance (Mahalanobis 1936) and stepwise discriminant function analysis (Dixon and Brown 1979) were the two multivariate procedures used. The results obtained from univariate comparisons will be presented first, followed by the results based on multivariate comparisons.

## RESULTS

### *Univariate Results*

Examining skeletal and dental traits individually indicates a number of similarities when the Watom and other Lapita-associated remains are compared with modern skeletal samples from the Pacific. These include tall stature, presence of rocker jaw in the mandibles, moderate incisor shoveling, oval-shaped fovea in the femoral heads, relatively well-developed areas for the attachment of the costo-clavicular ligament on the medial clavicle, bowed long limb bones, and squatting facets. These features, while not found exclusively in any one Pacific population, have been often cited as characteristic of Polynesians (Houghton 1980).

Features that clearly differentiate the Watom remains from other Pacific populations include the shapes of the lower jaws, tooth size, and long limb bone dimensions. The Watom mandibles typically possess short bodies and broad divergent rami—a morphological combination rarely, if ever, seen in Polynesian and Pacific populations. Watom teeth are small. Cross-sectional areas and tooth summary (TS) figures (Brace 1980) for the Watom (1140) and other Lapita dentitions are closest to those reported by Brace et al. (1989) for the Ainu (1141), Jomon (1151), and other east Asian samples. Finally, the long limb bones from Watom are generally long and slender, features that are not typical of Micronesians or Polynesians.

To summarize this part of the study, univariate results provide few definite conclusions regarding biological relationships. Some features (tooth size, for example) suggest east Asian affinities, while others hint at Polynesian connections. Still others find no morphological analogue anywhere in the Pacific.

## *Multivariate Results*

As a further means of assessing the biological relationships of the Watom and other Lapita skeletal remains, multivariate procedures were next applied to measurements recorded in the mandible, the most numerous and best-preserved bone in the Watom and Lapita samples.

Stepwise discriminant function analysis (Dixon and Brown 1979) and Mahalanobis's Generalized Distance (Mahalanobis 1936) were applied to measurements recorded in mandibles. The Lapita sample includes three mandibles from Watom, and one each from Tonga, Lakeba (Fiji), Natunuku, and Manus. The remaining samples represent near-contemporary populations of the Pacific, Southeast Asia, and East Asia.

Two separate analyses were made, one using 7 samples and 22 mandibular measurements and the second using 8 combined samples and 4 measurements.

### ANALYSIS I (7 SAMPLES, 22 MEASUREMENTS)

A plot of the 7 group centroids on the first 2 functions obtained in the first analysis, which uses 22 mandible measurements, is shown in Figure 2. The Lapita sample assumes an isolated position well separated from the Polynesian and Micronesian samples.

Cluster analysis of the Generalized Distance results using six measurements determined to be the most important discriminators by discriminant function analysis, shown in Figure 2, reiterates the isolation of the Lapita sample.

### ANALYSIS II (8 SAMPLES, 4 MEASUREMENTS)

In the second analysis, many more samples representing the major cultural-geographic regions of the Pacific and Asia are compared with the Lapita sample. Because of the larger number of specimens involved, the total number of measurements is reduced to four.

Figure 3 is a plot of the group centroids on the first two functions. The Lapita sample is closest to the sample of eastern Melanesian mandibles. Polynesia, Mainland Southeast Asia, Island Southeast Asia, and East Asia form a second distinct cluster in this diagram.

The dendrogram of the Generalized Distance results shown in Figure 4 suggests that the greatest differences are between the Lapita sample and all remaining groups. The Polynesian, two Southeast Asian, and East Asian samples occupy a single branch of the diagram. The eastern Melanesian, Bismarck, and Papuan samples form another constellation. The Lapita sample remains well separated from both groups.

Inspecting the original d-squared values (not presented) indicates that while the Lapita sample is far removed from all groups, it is relatively closest to the sample representing eastern Melanesia. The Polynesian and Bismarck samples are the next closest groups.

Together, these multivariate analyses reiterate the isolation of Lapita mandibles

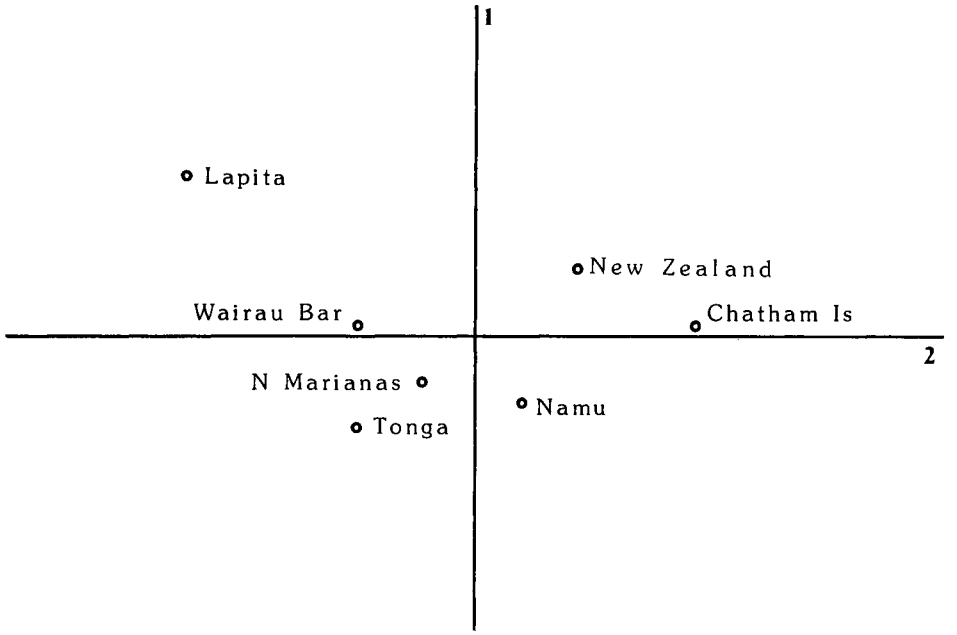


Fig. 1. Plot of 7 male centroids on the first 2 functions from stepwise discriminant function analysis using 22 mandibular measurements.

suggested in the univariate analyses but indicate a weak connection with eastern Melanesian, and possibly Polynesian, groups.

## CONCLUSIONS

In conclusion, univariate comparisons of eight Lapita-associated skeletons from Watom Island indicate affinities with Polynesians. Features the two share include rocker jaw, shovel-shaped incisors, and tall stature. Other morphometric features,

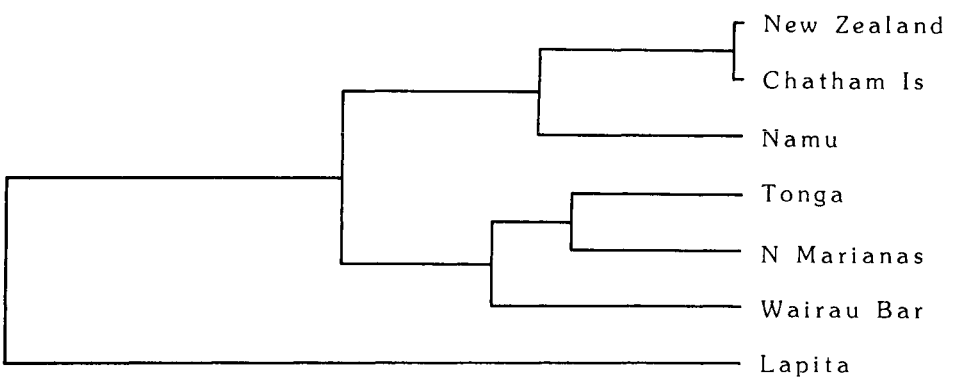


Fig. 2. Diagram of relationship based on a cluster analysis of Mahalanobis's Generalized Distance results using 6 mandibular measurements.

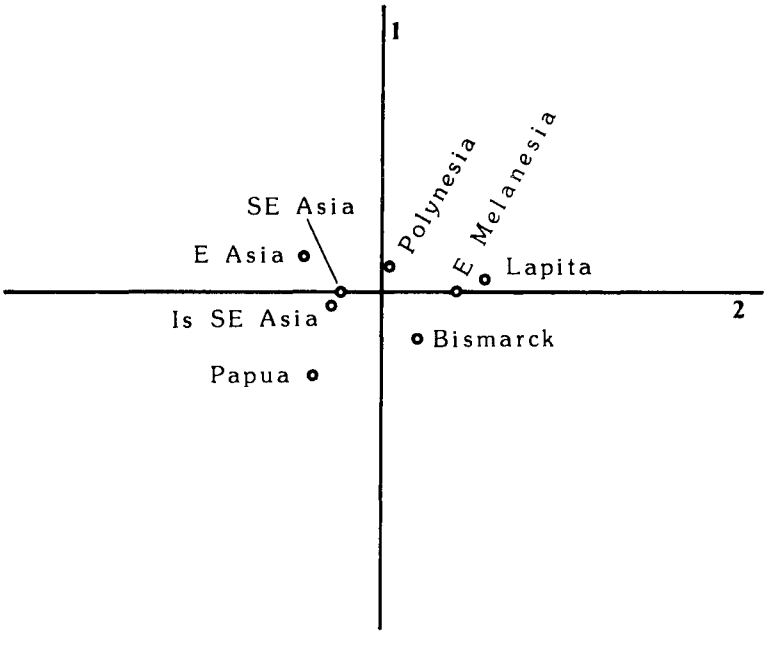


Fig. 3. Plot of 8 group centroids on the first 2 functions from stepwise discriminant function analysis using 4 mandibular measurements.

such as small teeth, gracile long limb bones, and broad short mandibles, suggest different conclusions. Multivariate analyses, while relying on a limited data base, underscore the uniqueness of the Watom and Lapita mandibles and weakly support the possibility of biological affinities with eastern Melanesia, Polynesia, and the Bismarcks. It should be remembered, however, that the first Polynesians were already living in Polynesia when the people associated with the Lapita Culture were in residence on Watom Island far to the east.

Focusing on the near-contemporary populations, the present results strongly sup-

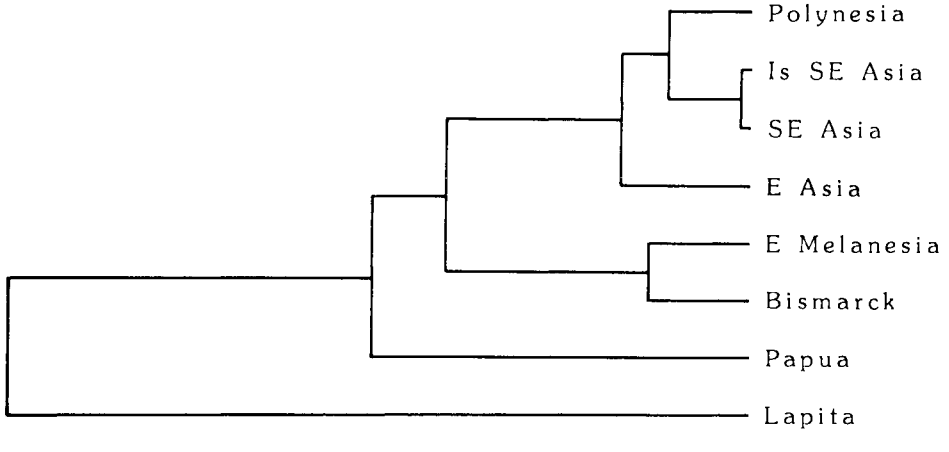


Fig. 4. Diagram of relationship based on a cluster analysis of Mahalanobis's Generalized Distance results using 4 mandibular measurements.

port a growing corpus of biological data (see, e.g., Brace and Hinton 1981; Howells 1979; Kirch et al. 1989; Pietrusewsky 1984; Serjeanston 1984; Turner 1982) that suggests it is impossible to derive Polynesians from Melanesians. These results further offer new evidence that Polynesians are more closely related to Southeast Asians.

The conclusions reached, especially those which use Lapita remains, should be viewed as tentative until more and earlier dated, Lapita-associated skeletons from the Pacific become available.

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